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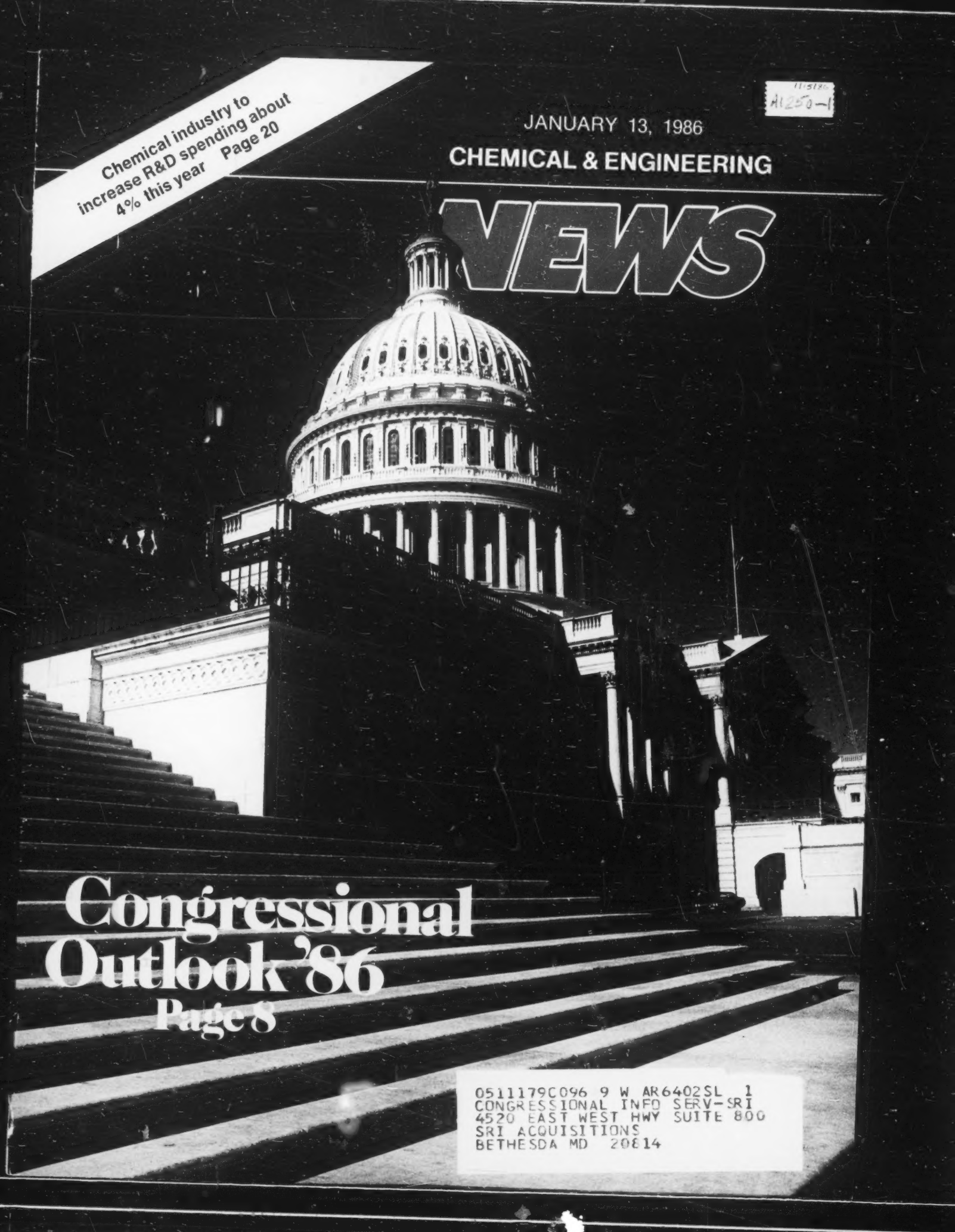
JANUARY 13, 1986

CHEMICAL & ENGINEERING

NEWS

Chemical industry to increase R&D spending about 4% this year Page 20



Congressional Outlook '86

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News of the Week

■ **Physical chemist John McTague named acting Presidential science adviser, but scientific community wants permanent leader to safeguard research budgets.** **Page 4**

■ **U.S. and Canadian envoys recommend that U.S. spend $5 billion to develop cheaper coal-cleaning methods to reduce acid rain.** **Page 5**

■ **Union Carbide successfully eludes GAF takeover.** **Page 5**

■ **Ruling on site of Carbide/India suit to be made soon.** **Page 5**

■ **Chemical industry adjustments in 1985 to recover from recession may lead to better performance in 1986, CMA survey indicates.** **Page 6**

■ **Accident at Oklahoma uranium processing facility leaves one person dead, some 30 injured.** **Page 6**

Business

The U.S. chemical industry's R&D spending will rise only 4% from that of 1985; although development of higher-value products is a desired goal, low profitability curbs spending. **Page 20**

Government

Problems of competition in commercialization of space technology foreseen in OECD report on trade-related issues of space. **Page 30**

Science

Spectroscopy techniques in subpicosecond times allow chemists to study excited molecules directly. **Page 36**

Demographic trends have less effect on the supply of scientists and engineers than do career choices and market forces. **Page 38**

American Chemical Society will begin publishing a new journal on energy and fuels research in January 1987. **Page 40**

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"Diet-Related Diseases: The Modern Epidemic" describes various toxic and biologically active substances in foods. **Page 41**

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News Focus

Much that Congress does in the upcoming session, including decisions on R&D funding, will be restricted by law to reduce the federal deficit. **Page 8**

Chemical Industry Will Spend Just 4% More on R&D in 1986

Companies' need to keep expenditures in line with earnings conflicts with desire to generate new, higher-value products

David Webber, C&EN New York

The chemical industry will boost its spending on research and development in 1986 by the smallest amount in years. A group of 13 companies with the largest chemical research programs plans to increase its R&D outlays by a composite total of just 4% next year, putting an end to an eight-year period marked by double-digit budget growth in every year except 1983, the year immediately following the end of the most recent recession.

The small size of the planned spending increase also means that R&D expenditures by the group of firms actually will decline in 1986 when adjusted for inflation. In constant dollars (1972 = 100), outlays will fall back about 1% this year compared with 1985's outlays.

The industry is curbing the growth of its research spending at the very time that R&D is assuming the key position in most companies' strategic planning. The generation of new, higher-value products through enhanced, more market-oriented R&D programs is widely considered a major part of the answer to the problems posed to U.S. producers by the increasingly global chemical marketplace. But the industry is also in a period of retrenchment touched off by the poor profitability of many operations in 1985. The effort to slash costs has been characterized most notably over the past 12 months by deep cuts in many firms' salaried work forces, reductions that have affected R&D workers.

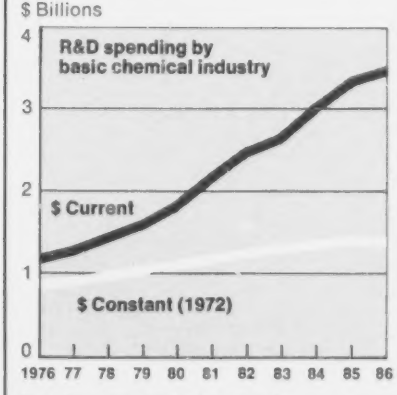
At Du Pont, the perennial leader in chemical R&D expenditures, retrenchment in the form of a massive early retirement program a year ago and continuing curtailment of research in what the company considers mature businesses has led to a sharp reduction in spending plans for 1986. Not only did the company, which had predicted a 10% boost in R&D funding for 1985, end up adding just 8% in 1985, it now intends to cut back outlays 5% this year. Traditionally, Du Pont's R&D budget has accounted for about a third of the group's research spending. Even though that share will fall under 30% in 1986, it is still large enough to skew the group's composite totals.

The slowing of R&D spending growth does not stem entirely from retrenchment. Some companies, such as PPG Industries, invested large increments of cash last year to launch new programs. Subsequent spending increases seem smaller by comparison.

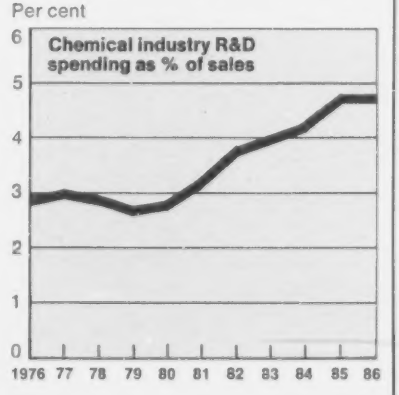
Furthermore, the smaller size of the budget increase for 1986 in no way reflects a diminishment of the chemical industry's current strong commitment to research. If just those companies other than Du Pont are considered (Du Pont can be factored out because the size of its work force reduction was extraordinary), R&D spending will rise a composite 7% in 1986. Although budget growth is still lower, the planned 7% increase for the non-Du Pont group is still greater than the sales growth of 5% or so that is anticipated for chemicals in 1986. As a result, R&D spending is reaching record heights as a share of sales. That measure, often considered a good, if rough, indicator of the relative importance of research to a company, did not reach a composite 4% for the group until 1983. In 1985, it rose to 4.8% and is likely to remain more or less on the same plateau this year as well.

The chemical companies' R&D budget decisions fit into the general pattern of research spending by

Growth of R&D outlays will slow in 1986 . . .



. . . but will remain near 5% as share of corporate sales



Note: For companies listed on page 21.
Sources: C&EN surveys and estimates, Battelle Columbus Laboratories

Smallest R&D spending increase of decade planned for 1986

$ Millions	Planned 1986	Actual 1985	Planned 1985	1984	1983	1982	1981	1980	Change from previous year 1986	Change from previous year 1985	R&D spending as % of sales 1985	R&D spending as % of sales 1984
Air Products[a]	$ 60	$ 51	$ 51	$ 44	$ 40	$ 37	$ 32	$ 30	18%	16%	2.8%	2.5%
American Cyanamid	265	250	250	237	215	190	172	148	6	5	7.1	6.1
Celanese	105	100	105	94	85	100	104	94	5	6	3.3	2.8
Dow Chemical	600	550	530	507	492	460	404	314	9	8	4.8	4.4
Du Pont[b]	1030	1080	1100	1000	875	775	647	591	−5	8	7.2	6.3
Ethyl	46	46	42	40	39	39	37	34	0	15	3.0	2.4
W. R. Grace	95	90	90	79	71	62	55	45	6	14	1.3	1.2
Hercules[c]	77	75	79	72	74	74	65	57	3	4	2.9	2.8
Monsanto	600	525	450	370	290	264	233	208	14	42	7.5	5.5
Olin	59	59	53	54	51	47	39	31	0	9	3.3	2.6
PPG Industries	188	185	185	150	127	127	119	103	2	23	4.3	3.5
Rohm & Haas	128	120	120	109	100	92	77	67	7	10	5.7	5.3
Union Carbide	265[d]	265	280	265	245	240	207	166	0	0	3.0	2.8
TOTAL	$3518	$3396	$3335	$3021	$2704	$2507	$2191	$1888			4.8%	4.2%
ANNUAL CHANGE	4%	12%	10%	12%	8%	14%	16%	16%				

a Figures are for fiscal year ending Sept. 30. b All figures exclude Conoco. c Figures up to and including most of 1983 include polypropylene-related R&D. Since November 1983 polypropylene R&D has been part of Himont joint venture. d Estimate. na = not available.

all U.S. industries. Company-funded R&D investment is expected to grow about 9% next year after a 12% increase in 1985, according to a National Science Foundation survey. The survey found that the cutback in growth resulted from uncertainty on the part of corporate management about this year's economic outlook. Member companies of the survey sample, which account for 53% of all U.S. company-funded R&D expenditures, said they were unsure how lower interest rates, the strength of the dollar, the rise of imports, and the increase of overseas competition would affect sales and earnings this year.

According to NSF, spending on chemicals and allied products research, which includes the pharmaceutical industry, will rise 10% this year. The smaller industrial chemicals segment will boost spending just 9%. The survey, however, was conducted in mid-1985, when executives might have been more sanguine than now.

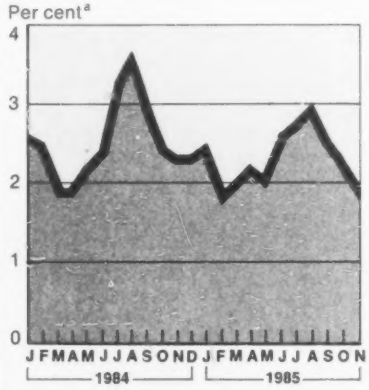
Chemicals and allied products R&D spending continues to account for about 16% of all U.S. industrial research outlays. In 1986, NSF predicts chemical R&D expenditures will be $9.5 billion out of total U.S. industrial research funding of $57.8 billion. Only two industrial segments—machinery and electrical equipment—will spend more on research than the chemical industry. According to the survey, the machinery industry will spend $10.9 billion on R&D this year, and the electrical equipment industry $10.7 billion.

R&D spending in other segments will be motor vehicles and motor vehicles equipment, $6.3 billion; professional and scientific instruments, $4.9 billion; aircraft, $4.8 billion; and all others, $10.7 billion. In 1985, company-funded research in the U.S. totaled $53.2 billion. Last year's list was led by the electrical equipment industry at $10.0 billion, followed by machinery, $9.8 billion; chemicals and allied products, $8.6 billion; motor vehicles and motor vehicles equipment, $5.9 billion; professional and scientific instruments, $4.6 billion; aircraft, $4.4 billion; and all others, $9.9 billion.

Also, despite being smaller, chemical R&D spending in 1986 will maintain a long-term trend toward an ever-larger research component in the chemical industry's future-oriented spending (capital spending plus R&D spending). The trend reflects the industry's overall shift

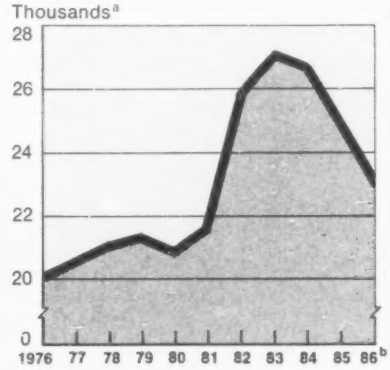
Air Products research worker tests bacterial cultures

Although professional unemployment declines . . .



a Unemployment rate for professional specialty employees, including engineers, mathematical and computer scientists, natural scientists, health diagnosing occupations, health assessment and treating occupations, teachers, lawyers, and judges. Not seasonally adjusted.
Source: Bureau of Labor Statistics

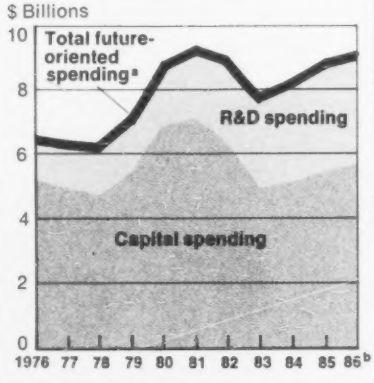
. . . the chemical industry employs fewer researchers



a Full-time equivalent R&D scientists and engineers in basic chemical industry at the beginning of the year. b Estimate. **Sources:** National Science Foundation, C&EN estimate

in emphasis from high volume to high-value-added products. As a result, between 1976 and 1986, composite R&D spending for the group of 13 companies tracked by C&EN has grown at an annual rate of 12%, more than tripling from $1.2 billion in 1976 to a projected $3.7 billion this year. Capital spending for the same group, on the other hand, features a 10-year annual compound growth average of just 0.6%. The group's capital outlays peaked at $7.1 billion in 1981; this year it likely will total about $5.6 billion. In another way of looking at it, R&D spending, which accounted for just 18% of chemical future-oriented expenditures in 1976, will account for about 40% of such outlays this year.

R&D takes growing share of future-oriented spending



a Total R&D and capital spending for chemical companies listed on page 21. b C&EN estimates

Within the group of companies surveyed, Air Products plans to boost its R&D spending by the highest percentage next year. The company, which had the highest profit margin of any of the 15 largest chemical firms over the first nine months of 1985, will lay out $60 million on R&D this fiscal year (ending Sept. 30), up 18% from fiscal 1985, which was up 16% from fiscal 1984. The fiscal 1986 forecast does not include an estimated $20 million worth of customer-funded R&D that the company will undertake.

The Allentown, Pa.-based company intends to divide some 80% of this year's R&D budget between new technology initiatives in its four core areas—air separation, polymer and amine chemistry, catalysis, and inorganics—and technology diversification into electronics, ceramics, microbiology, and noncryogenic separation. The remainder will be devoted to improving existing technologies in the core businesses.

Monsanto is the only other company planning a double-digit increase this year; it expects to expand its 1985 R&D expenditures of between $500 million and $550 million to between $550 million and $650 million this year, or about 14% based on the range midpoints. Monsanto data show a 42% leap in R&D spending between 1984 and 1985, but $75 million to $150 million of last year's increase is attributable to R&D carried out by G. D. Searle.

Without the acquisition, 1985 R&D spending would have risen to between $400 million to $425 million, a spokeswoman says, up 22% and below the $450 million the company forecast at this time last year. Of this year's total research outlays, she says, non-Searle activities will account for $450 million to $500 million, meaning the actual increase could be as low as 6% and as high as 25%. Calculating from the range midpoints, non-Searle R&D spending will rise 15%.

Monsanto is still weighing the final size of this year's R&D budget, chief executive Richard D. Mahoney noted at a press luncheon last week. The company, which has been accused by some analysts of spending too lavishly on R&D, is cutting back in some areas. Some long-term plant growth regulator work has been terminated already, and Mahoney plans to prune the health care project list as well.

The acquisition of Searle, however, means that 1986 probably will be the year in which Monsanto spends as much as Dow Chemical. (As recently as 1983 Monsanto spent less than 60% as much on R&D as did Dow.) Dow has set aside about $600 million for R&D in 1986.

One of the sharpest declines in funding growth will be at PPG, which, after raising its R&D outlays 23% in 1985, will add just 2% to its budget in 1986. The explanation, however, is the large, initial funding last year for PPG's new collaborative biotechnology program with the Research Institute of Scripps Clinic in La Jolla, Calif.

The increases in R&D spending by the group of 13 chemical firms in 1985 meant that the portion of sales dollars devoted to research rose at every member of the group last year. Climbing to the top of the list from third in 1984 was Monsanto, where the R&D spending-to-sales ratio jumped to 7.5% from 5.5%. Next highest was American Cyanamid at 7.1%, up from 6.1% the year before. Following was Rohm & Haas at 5.7%, up from 5.3% in 1984. □